Remarks

Formal drawings will be submitted upon receipt of an indication that the application is otherwise in allowable condition.

Reconsideration of the rejection of claims 1-19 as being obvious over the de Boer reference in view of the Gopinathan patent is respectfully requested. Claims 1-19 call for a method for measuring the agglomerative state of asphaltenes in oil containing asphaltenes to comprises applying to the oil a series of pulses of acoustic energy. Each pulse comprises acoustic energy over a range of frequencies. At least a part of the energy is thereby scattered. The scattered acoustic energy is detected for each of a plurality of pulses in the series to produce amplitude versus time data. The amplitude versus time data is then resolved to obtain a magnitude of the detected scattered acoustic energy at selected frequencies. The magnitude for each pulse at each selected frequency is then averaged over the plurality of pulses and the agglomerative state of the asphaltenes is determined from the averaging. In short, therefore, claims 1-19 as amended call for applying a series of pulses of a range of frequencies of acoustic energy to the oil, detecting the resulting scattered energy over a range of frequencies for each of a plurality of the pulses to produce amplitude versus time data, which are then not merely averaged, but resolved to obtain magnitude versus frequency data, which are then averaged. The agglomerative state is then determined from that averaging.

By contrast, the de Boer method involves simply receiving the back-scattering of short bursts of acoustic energy and converting it into a read-out signal that is sorted by a multi-channel analyzer into amplitude classes corresponding to particle sizes. Thus, the de Boer method is a simple sorting of amplitude classes with little if any further description. De Boer does not disclose or suggest applying a series of pulses, each of which covers a range of frequencies of acoustic energy. Nor does it disclose or suggest producing amplitude versus time data. Nor does it disclose or suggest resolving the amplitude versus time data to obtain magnitude versus frequency data. Nor does it disclose or suggest averaging the magnitude versus frequency data. Nor does it disclose or suggest determining the agglomerative state from that averaging. Instead, de Boer uses a multi-channel analyzer into amplitude classes corresponding to particle sizes, thus pre-supposing certain relative particle sizes and relationship between amplitude and particle sizes. Accordingly, the de Boer method is very different from that of the present claims.

The Examiner, however, asserts that it would have been obvious "to use the method of magnitude vs. frequency as taught by Gopinathan in the method of de Boer to determine the agglomerative state of the particles, since this allows for assaying, simultaneously for plural classes of agglomerating analytes discriminated by their size..., which yields a more detailed representation of the agglomerative state of the particles than the method of de Boer, which yields only an average agglomerative state." The Examiner further has stated that "Gopinathan provides [an] ultrasonic signalling technique that would provide more detailed representation of agglomeration in a fluid by the use of selected frequency ranges and the production of amplitude versus time data..., and would thus be desirable for use in the method de Boer." (Office Action, page 7). It is not understood what is meant by this. Applicants believe that there must be a clerical error in this statement and guess that what was meant by the Examiner was: "Gopinathan provides [an] ultrasonic signalling technique that would provide more detailed representation of agglomeration in a fluid by the use of selected frequency ranges **than** the production of amplitude versus time data..., and would thus be desirable for use in the method de Boer." Applicant's response is based on this assumption.

The Examiner's assertion ignores several points made by Applicants and several limitations and deficiencies of Gopinathan. Gopinanthan describes a method and apparatus very different from that disclosed by de Boer and that of the present application and is not applicable to the de Boer situation or to the present situation. **The Gopinathan method is a limited technique for assaying a limited number of analytes --preferably up to four analytes-- in a liquid sample. The Gopinathan method employs a reagent including a first class of particles that are dimensioned within a predeterminedly narrow range of particle diameters and are coated with a reactant capable of entering into a reaction involving the analyte so as to generate particles of different dimensions than those of the original classes and of characteristic acoustic scattering cross sections, and a second reagent including a second class of particles that are substantially larger than those of the first class and are coated with the noted reactant.** Gopinathan forms a mixture of the reactant coated particles of the two classes with the sample to be tested so as to cause a specific reaction involving the reactant and the analyte to form conjugates of the first and second classes of particles. Thus, Gopinathan does not measure acoustic scattering by the particles but rather by conjugates formed in the reaction. The conjugates have characteristic acoustic scattering cross-sections and

irradiating them with compressional waves in a predetermined frequency range causes a reduction in forward energy of the waves, which is then detected. Clearly, the Gopinathan technique is completely different from either the de Boer method or the present method. **Gopinanthan does not measure the particles directly or determine particle sizes per se, but rather reacts the particles with two reactants, measures the acoustic characteristics of the reaction products and segregates reaction product data into pre-determined categories.**

Gopinathan, therefore, is simply inapplicable to situations, such as those in de Boer and the present invention, where uncontrolled agglomeration results in no set number of particle diameters nor any predetermined or set particle sizes and where addition of reactants to the tested fluid is not appropriate. And, contrary to the Examiner's assertion, the Gopinathan method is not simply a replacement of measuring magnitude versus frequency instead of amplitude versus time in de Boer. The Gopinathan is much more complicated, indirect and limited.

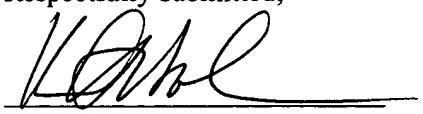
Accordingly, it is not seen how a method such as described by Gopinathan, wherein a limited number of discrete particle sizes must be not only present but known in advance, can be adapted to either de Boer or the present situation wherein a continuum of particles sizes of unpredictable sizes may be present. Moreover, it is not seen how the Gopinathan method, wherein scattering not by the particles but by products enlarged by two separate reactions is measured, can be applied to the de Boer and present methods where scattering by the particles themselves are measured and reactions with the particles -- particularly reactions to INCREASE the particle size -- is not appropriate, especially for in-line tests. Indeed, the fact that Gopinanthan requires particle enlargement indicates that the method of Gopinathan is NOT OPERABLE with particles of native size. Thus, while the de Boer and present methods need not alter or interfere with the fluid being analyzed, the Gopinathan method causes a reaction in the fluid. The Gopinathan method would have to be carried out by extraction of a sample or it would contaminate the process flow stream. It is not seen how the Gopinathan disclosure could be combined with the de Boer teaching at all. And contrary to the Examiner's claim, the claimed method is not a single substitution of measuring magnitude versus frequency as opposed to amplitude versus time but a measurement of amplitude versus time data that is then resolved to magnitude versus frequency data. Thus, claims 1-19 distinguish patentably over the de Boer reference in view of the Gopinathan patent. The method of the present invention, which determines a particle size distribution for any number of sizes of particles found in a fluid such

as oil. The method is flexible in that it applies to particles of numerous non-predeteremined sizes and that are found inherently in the oil. The method does not change the particles or the oil tested. Thus, it can even be placed on-line without interfering with the oil composition or flow.

Favorable reconsideration is also respectfully requested of the rejection of claims 1-11, 15-22 and 24-26 under the judicially created doctrine of obviousness-type double patenting over claims 1-20 of U.S. patent 5,969,237. All claims of the present application call for averaging the resolved magnitude versus frequency data. None of the claims of the cited patent refer to any manipulation of the magnitude versus frequency data. As noted above, it has been found that basing the relationship on a single pulse of energy can result in erroneous readings, perhaps due to the orientation of particles at that time of that pulse. The fact that this is the result of the mere standard averaging out of errors as asserted by the Examiner is shown by the fact that improvement is found by applying a series of pulses, detecting for each of those pulses the back-scattered energy, **resolving the data derived from those detections such as by a Fourier transform** and then averaging the resolved data over the series. If the improved accuracy were the result of mere averaging out errors, one would not expect the improvement associated with first resolving the data such as by a Fourier transform. Claims 15 and following specifically call for this resolution. The claims of the cited U.S. patent nowhere teach or suggest that repeated pulses would do more than simply duplicate the original data, or that averaging the resolved results therefrom would improve the measurement of the agglomerative state. Thus, it is submitted that claims 1-11, 15-22 and 24-26 distinguish patentably over the cited U.S. patent.

In view of the foregoing, favorable reconsideration and early allowance of the subject application are earnestly solicited.

Respectfully submitted,



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